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The effectiveness of two classes of verbal reinforcement on the performance of second-, fifth-, and eighth-grade children

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THE EFFECTIVENESS OF TWO CLASSES OF VERBAL REINFORCEMENT
ON THE PERFORMANCE OF SECOND-, FIFTH-, AND EIGHTH-GRADE CHILDREN

A Thesis

Presented to the
Department of Psychology
and the
Faculty of the Graduate College
University of Nebraska at Omaha

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
Douglas D. Settles

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ABSTRACT

The effects of two classes of verbal reinforcers, correctness and social, were examined among 108 second-, fifth-, and eighth-grade, middle-class children. The effectiveness of verbal reinforcement was measured by a change in the S's response preference on a marble-sorting task. Results of the study were (a) that there were no initial age differences in the magnitude or direction of the baserate responses, (b) that correctness reinforcement was more rewarding across all levels of age than social approval, (c) that for eighth-grade Ss, correctness reinforcers were significantly more rewarding than either social or no reinforcement, and (d) that a post hoc analysis on sex of S revealed a differential sex effect for the social reinforcement condition, but not for the correctness treatment. The results of this experiment support the notion that, as a child grows older, a change takes place in the strength in effectiveness of correctness reinforcers.

INTRODUCTION

This was a study of social reinforcement in children. The primary purpose of this investigation was to test the notion that a change in reinforcer effectiveness occurs with increasing age. The specific hypothesis tested was that correctness feedback is more effective for older than younger children. Knowledge of any age change in the effectiveness of various reinforcers will greatly aid in the understanding of the underlying processes which are involved in developmental changes in behavior.

Zigler (1963) defines a reinforcer in the following manner: "If a response of the child is followed by such stimuli (reinforcer), the likelihood of occurrence of that response, its rate of emission, or its amplitude is increased (p. 614)." It is known that the effects of various reinforcements upon the child's behavior differ (Terrell & Kennedy, 1957). Furthermore, there is good reason to believe that a change takes place in the strength of various reinforcers with increasing age. For example, a small child is usually reinforced by primary reinforcers such as cookies, candy, and other edibles. As that child grows older, however, the reinforcement changes to secondary reinforcers such as money and verbal approval. Of particular importance is the effectiveness of correctness feedback as a reinforcing agent. A preschool child is probably rewarded very little with correctness reinforcers, (i.e., "That's right", or "That's correct"). As the child advances in school, however, he is reinforced by such things as how many words he spelled right, how many arithmetic problems he added correctly,

or by receiving a percentage of right versus wrong answers on a test. Therefore, the self-reinforcing properties of being correct may gain increasing control over the child's behavior as he grows older and the previously described experiences accumulate. As Rosenhan and Greenwald (1965) stated, "The young child is initially dependent upon externally administered reinforcements and with increasing age comes to rely more heavily upon reinforcers intrinsically related to his own responses (p. 109)."

Several empirical studies attest to the validity of the developmental analysis of reinforcer effectiveness presented in the last paragraph. Zigler and Kanzer (1962) have studied the effectiveness of two different verbal reinforcers on the behavior of middle- and lower-class children. The authors hypothesized that reinforcers denoting praise ("Good" and "Fine") would be more effective with lower-class children, while words denoting the state of being correct ("Correct" and "Right") would be more effective with middle-class children. Second-grade children were given the Warner's Index of Social Characteristics to define socio-economic class. The experimental game used was the marble-dropping task first introduced by Gewirtz and Baer (1958). The "game" was played for ten minutes, the first three of which constituted the baseline period. After this period the E reinforced the hole least preferred during the last minute of the baseline period. Half of the Ss were given a social reinforcement ("Good" or "Fine") and half a correctness reinforcement ("Right" or "Correct"). Results of this study

supported the authors' hypothesis. Praise reinforcers were more effective than those emphasizing correctness with lower-class children, while correctness reinforcers were more effective than social reinforcers with middle-class children.

Rosenhan and Greenwald (1965) failed to confirm Zigler and Kanzer's (1962) results dealing with approval reinforcement and social class. They did, however, find a significant difference with correctness reinforcers in second- and sixth-grade children. Like the Zigler and Kanzer (1962) study, a marble-sorting task was used to measure reinforcer effectiveness. Social approval ("Good" and "Fine") and correctness feedback ("Right" and "Correct") were again used as the reinforcers. No significant differences between the second- and sixth-grade children in their responsiveness to social reinforcers were found. There was a reliable age difference, however, when using correctness reinforcers; the sixth-grade children performed better when reinforced verbally with "Correct" and "Right" than did the second-grade children.

Two very similar studies (McCullers & Stevenson, 1960; Lewis, Wall & Aronfreed, 1963) compared the performance of different age children on a probability learning task. Lewis et al. (1963) hypothesized that verbal approval (social reinforcement) would have a greater value for first-grade children than the nonsocial reinforcement of a light that signified a correct response. No difference in favor of social reinforcement was expected among sixth-grade children. These expectations were based on the view that "repeated social approval would show a decrement in value with increasing age.

and that the intrinsic reinforcement attached to being correct would show a corresponding increment (p. 134)." The training trials were given with the probabilities of the left and right levers being correct in a ratio of 7:3. In the nonsocial reinforcement condition a green light was turned on by the E whenever the S was correct. In the social reinforcement condition the E sat behind the S and said either "Good" or "Fine" whenever the S's response was correct. The results supported the hypothesis that social approval had a greater effect for second-grade children. As expected, the authors found no difference between the treatments for sixth-grade children, and attributed this fact to the decreasing value of social approval together with an increasing value of correctness reinforcement for older children. McCullers and Stevenson (1960) found very similar results using preschool and first-grade children in another probability learning situation.

Studies concerned with children's conformity behavior have suggested that the reinforcing properties of correctness increase with age. Hoving, Hamm, and Galvin (1969) found that conformity changes from a negative function of age on unambiguous perceptual tasks to a positive function of age on very ambiguous (insoluble) tasks. In an unpublished review chapter, Hamm (1970) explained these developmental differences in conformity behavior by proposing that

"(1) the reinforcing properties of being correct increase with age, (2) the reinforcing properties of being in agreement with the group reward conformity behavior regardless of the ambiguity of the task, and (3) on

unambiguous tasks the reinforcing properties of correctness reward nonconformity behavior. . .(p. 31)".

Hence, if the reinforcing properties of correctness increase with age, the tendency of children to yield to the incorrect answers of others will be negatively related to age on unambiguous tasks and positively related to age on ambiguous tasks.

The present study partially replicated the Rosenhan and Greenwald (1965) experiment by using a marble-sorting task slightly modified to accommodate for certain methodological problems described by Parton and Ross (1965; 1967) and Stevenson and Hill (1966). The experiment tested the hypothesis that correctness feedback is more effective for older than younger children, while no developmental effect was expected for social approval.

METHOD

Subjects

The Ss consisted of 108 public school children, all of whom were white, and predominately middle-class from the second-, fifth-, and eighth-grades of School District 66, Omaha, Nebraska. They were divided into nine equal groups on the basis of grade (second, fifth, or eighth) and treatment (social approval, correctness feedback, or control--no reinforcement). The grade and treatment breakdown relative to sex of S was as follows: Second-grade--correctness (6 males, 6 females), social (6 males, 6 females), control (6 males, 6 females); fifth-grade--correctness (6 males, 6 females), social (5 males, 7 females), control (4 males, 8 females); eighth-grade--correctness (5 males, 7 females), social (6 males, 6 females), control (5 males, 7 females).

Apparatus

The apparatus was placed in a reasonably sound proofed, 8' x 10' room. A curtain separated the room into two sections, the S's room and the E's room. The S's room housed the S, the marble-sorting apparatus, a cassette recorder, and a table. The E's room housed the E, an Esterline Angus Event Recorder, a timer (stop watch), and a control panel for the marble-sorting apparatus. Because of a need to change schools to acquire additional children, the last 18 Ss were run in an 8' x 22' Mobile Research Laboratory. The trailer consisted of a S's room and an E's room separated by a one-way mirror.

The marble-sorting device consisted of a wooden frame, 2' x 3', with a panel containing a row of three lights. Situated below the middle light was a container holding marbles. Beneath the right and left lights were holes in which the marbles were dropped. The marbles dropped by way of a rubber hose to a water container, which minimized any noise that could serve as feedback for the S (see Stevenson, 1965). A photo cell mounted just below each hole recorded the marble drop on the Esterline Angus. The cassette recorder was used to dispense the verbal reinforcers which were either social approval or correctness feedback. The recorded messages were used to minimize the variability in voice inflections and to depersonalize the message the S received. The verbal reinforcements were reported on two separate cassette tapes. The stop watch was used to evenly space the experimental trials.

Experimental Task

The task consisted of two parts. The first part was a baserate period (see Parton & Ross, 1965). The baserate period consisted of 4-minute series of 48 discrete trials which required a S to drop a marble. The middle light was used to signal the S every five seconds when to make a response. During the baserate period the S was free to respond to either the right or left hole. At the end of the 4-minute period a measure was taken as to which hole the S responded to the least, hereafter referred to as the S's least preferred hole.

The second part of the experimental task consisted of three, 4-minute experimental trial blocks. During these trial blocks one of the three lights was turned on every five seconds. When the left light was on, the S was required to drop a marble down the left hole; when the right light was on, the S was required to drop a marble down the right hole. When the middle light went on, the S had a choice of dropping a marble down either the right or left hole. The last paradigm constituted an experimental trial where a measure of response change was taken.

Reinforcements in the present study consisted of "That's fine" and "That's good" for the social approval treatment group, and "That's right" and "That's correct" for the correctness reinforced group. Reinforcements were never given following a "Free Choice Response". A reinforcer was given only after a marble dropped down the S's least preferred hole. The marble drop which was reinforced was preceded by the light being turned on corresponding to that hole. The same amount of social and correct reinforcers were used in each treatment group. Within each treatment condition the two different verbal reinforcers were randomized and used an equal number of times.

The sequence of which light was turned on was randomized with the following restrictions: (1) a standard intertrial interval of 5-seconds was used, (2) within each series of six trials or every 30-seconds, each light was on twice. The order of which light was turned on within each series of six trials was randomly determined.

Procedure

A letter of consent was sent to the parents of the second- and fifth-grade Ss requesting permission to use their child in the experiment. No parent refused permission.

Subjects were escorted by the E from their classrooms to the experimental room. The S was then directed to stand in front of the marble-sorting apparatus. While the S was standing in front of the marble-sorting apparatus, the following instructions were read:

"In front of you is a new kind of game. It's called 'Drop-the-Marble'. This is the game we are going to play today. There are two parts to this game. Pay attention now because this game has rules like all games, and each part will have different rules. Part I of this game consists of putting these marbles (E points) down the left hole or down the right hole (E points). The rules for Part I say that you have to drop a marble down one of these two holes (E again points to the two holes) whenever this middle light comes on (E points to the middle light). This part of the game is called 'do-what-you-want'. Remember now, you can put a marble down either this (E points to the left hole) or this (E points to the right hole) hole, but the rules say you must put a marble down one of the holes whenever the light goes on. Now let's do one just for practice. (E turns on middle light and lets S put a marble down one of the holes and then corrects S's errors, if any). Okay, I'll be back after Part I is completed to tell you about Part II. (E then left the S's room)."

After the baserate period ended, E then came back and completed the following instructions for the experimental period.

"Part II of the game involves all three lights (E points to all three lights). This part of the game is a little different than Part I. The rules say that when the left light goes on (E points to the left light) you have to drop a marble down the left hole (E points to the left hole). When the right light goes on (E points to right light) you have to drop a marble down the right hole (E points to right hole). Now when the middle light goes

on, you can, like in Part I, drop a marble down either of the holes, 'do-what-you-want'. Remember, you must drop a marble whenever one of the lights goes on. Now let's practice this part just for fun. (E turns on the left light and waits for a marble drop, the right light and waits for a marble drop, and then the middle light and waits for a marble drop and corrects S's errors, if any).

Okay, you did very well, now let's finish the game. Remember when the middle light goes on you can 'do-what-you-want'. I'm going into the other room to do some work, but I'll be back when the game is over. Do you have any questions? (E answers the questions, then goes to the E's room.)"

After the S finished the experiment, he was thanked by the E and asked to keep what happened in the room a secret.

RESULTS

As previously mentioned, the experimental task was divided into two parts. The first part was a 4-minute baserate period where no reinforcement was given. The S was free to respond to either hole. The second part of the experimental task consisted of three, 4-minute trial blocks where reinforcement was given to the treatment groups. To measure the influence of verbal reinforcement conditions, a difference score was obtained for each S by subtracting the baserate score from each of his three treatment block scores. The baserate score was the total number of times the S responded to his least preferred hole during the 4-minute baserate period. The treatment score was the total number of times the S responded to his least preferred hole during each of the three, 4-minute experimental blocks. A positive difference score indicated that the S responded more frequently to his least preferred hole during the treatment blocks than he did during the baserate period. It was expected that if the social reinforcement conditions were effective a positive difference score would be obtained.

A 3 (grade) X 3 (treatment) X 3 (treatment blocks) repeated measures analysis of variance was performed on the difference scores. The analysis indicated any inconsistencies across age in the effectiveness of social, informational, or no reinforcement. In addition, two separate repeated measures analyses of variance were performed on the baserate scores to indicate any age difference in initial response preference. One analysis involved a 3 (grade) X

3 (treatment) repeated measures analysis of variance on the base-rate preference data without regard to sign. Another 3 (grade) X 3 (treatment) analysis was completed on the baserate preference scores with sign. The former analysis tested the magnitude of the child's response preference without regard to direction; the latter analysis tested for any change in the direction of the child's response preference. Arbitrarily, a preference for the right hole was indicated by a positive sign.

Magnitude of Baserate Preferences

It was expected that older Ss would favor one hole over another more than younger children since they have had a longer period of time to develop response preferences. However, the analysis of variance revealed no significant differences in the strength of preference during the baserate for any of the three grade levels or treatment conditions. In other words, adolescents did not appear to manifest stronger response preferences than children. No other main or interactional effects were found to be significant in the magnitude of baserate preference analysis.

Directional Differences in Baserate Preference

Like the analysis of the magnitude of baserate preferences, there were no initial differences in the three grades with respect to the baserate preference with sign. Hence, adolescents do not appear to manifest stronger right or left response choices. No other main or interactional effects were found to be significant for the analysis on the direction of children's preference.

Difference Score Analysis

Treatment.--The main effect for treatment yielded an $F=4.84$ ($df=2/99$, $p<.05$). The mean difference score for the correctness group was 6.18, for the social group 1.97, and for the control group 1.03. Accordingly, the correctness reinforcement treatment appeared more reinforcing than either the social or no reinforcement procedures. Individual group comparisons indicated that the correctness treatment differed significantly from both the social ($F=5.69$, $df=1/99$, $p<.025$) and control groups ($F=9.51$, $df=1/99$, $p<.005$). There was no significant difference between the social and control groups ($F=.30$, $df=1/99$, $p>.05$).

Age X Treatment.--The interaction of Age X Treatment yielded an $F=0.75$ ($df=2/99$, $p>.05$). In the absence of a significant overall effect, Winer (1962) states, "The specific comparisons which are built into the design or suggested by the theoretical basis for the experiment can and should be made individually, regardless of the outcome of the corresponding over-all F test (p 208)." A simple main effects analysis of the overall interaction revealed significant treatment differences for eighth-grade Ss, with the correctness treatment producing the most change in preference, followed by the social and control treatments ($F=4.35$, $df=2/99$, $p<.025$). No significant treatment differences were found using a simple main effects analysis for the two younger age groups.

To avoid enhancing the problem of a Type I error, the Scheffé's method was used to test differences between the three treatment conditions for eighth-grade Ss. Using this method an $F=8.69$

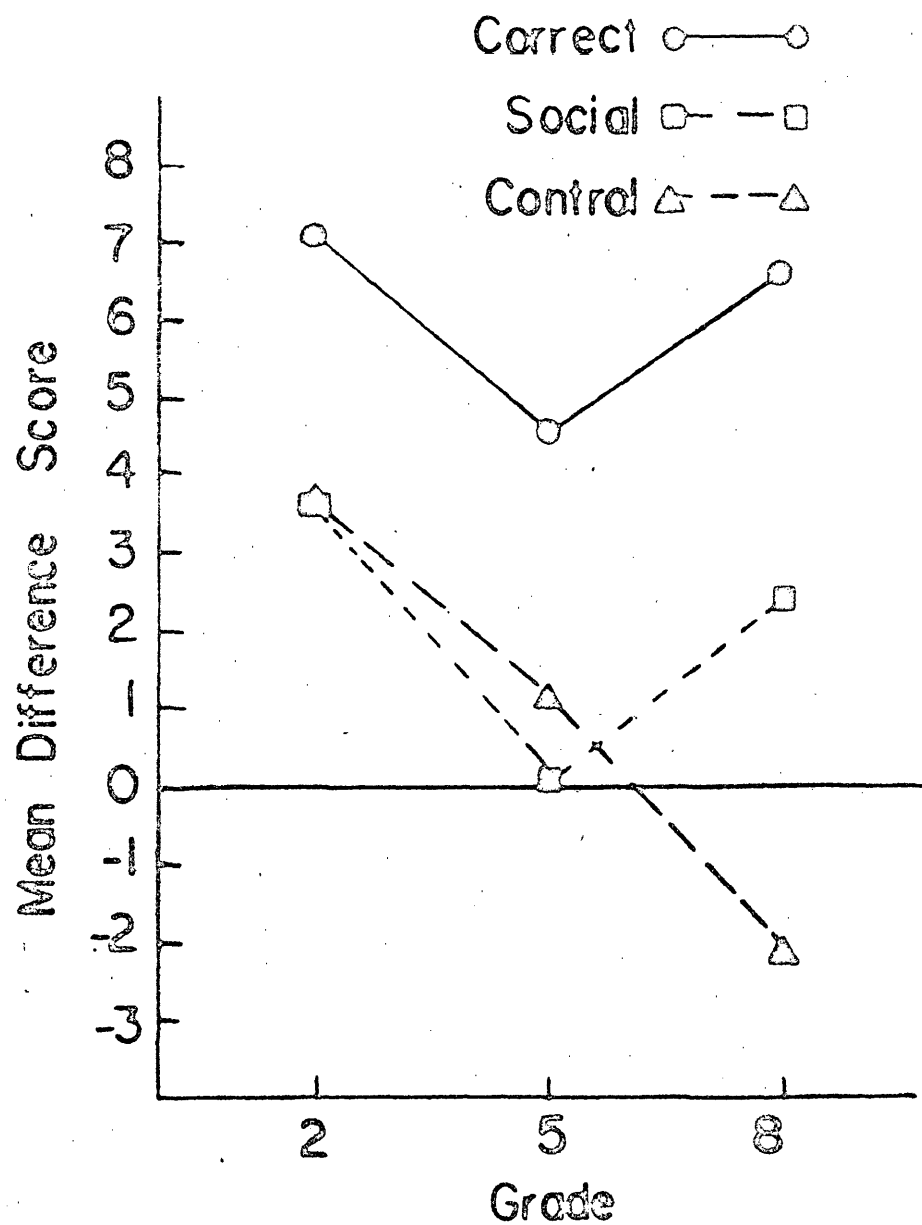


Fig. 1.--Mean Difference Scores as a Function of Age in the Correctness, Social, and No Reinforcement Conditions.

($df=1/99$, $p<.005$) was obtained between the correctness and control group. With the observed value of F (8.69) being greater than the critical value (6.20), using the Scheffé's method, the difference between the correctness and control groups was statistically reliable. There were no other significant differences for either the correctness and social group comparison ($F=2.87$, $df=1/99$, $p>.05$), or the social and control group comparison ($F=2.06$, $df=1/99$, $p>.05$). Hence, a significant verbal reinforcement effect was found for the correctness treatment.

As can be seen in Figure 1, the correctness and social treatments formed nonmonotonic relationships across age. These groups manifested a marked curvilinear relationship between preference change and grade; specifically, the intermediate age group appeared to be less susceptible to verbal reinforcement than either the second-grade children or the eighth-grade adolescents. However, a simple main effects analysis revealed no significant differences ($p>.10$). As reflected in Figure 1, the control group demonstrated a negative linear relationship between preference change and grade; that is, increases in age were associated with approximately equal decreases in change in response preference. Although this group produced a marked negative linear function across age, a simple main effect analysis did not yield a significant developmental difference ($F=1.94$, $df=2/99$, $p>.10$).

No other interactions or main effects were found to be significant in the analysis of variance performed on the treatment difference scores.

DISCUSSION

As previously mentioned, the purpose of the present study was to examine the developmental view that as a child grows older, a change takes place in the strength in effectiveness of various reinforcers. The specific hypothesis tested was that a correctness reinforcer is more reinforcing for older than younger children. The results of the present experiment partially supported the preceding hypotheses.

At a molar level of analysis, an apparent verbal reinforcement effect was found. A greater change in response preference for the correctness group as compared to the social and control groups, was statistically reliable as indicated by individual F tests. The latter two treatments did not significantly differ. Apparently, verbal approval such as "That's fine" and "That's good" had no more reinforcing effect than the absence of any verbal reinforcement in changing the Ss response preferences. Indeed, across all ages, reinforcers signifying correctness ("That's right" and "That's correct") were the only verbal reinforcements which produced a significant change in response preference. Such a result would be expected from the Zigler and Kanzer (1962) study which found that words signifying correctness were more reinforcing for middle-class than lower-class Ss.

Several possible explanations could be given for the absence of a significant social reinforcement effect. First,

Ss were from a middle-class socio-economic level. As predicted from the Zigler and Kanzer (1962) study, the lower-class children would be more susceptible to social reinforcers than correctness reinforcers. Second, as predicted from studies dealing with deprivation-satiation (Gewirtz & Baer, 1958), these Ss may have been satiated on social reinforcers. Third, the verbal reinforcement was dispensed in a depersonalized manner by means of a tape recorder. In general, studies that have found a significant social reinforcement effect have used a live model who dispensed a personalized message (see Stevenson, 1965). A post hoc analysis on sex of S revealed no differences in the correctness treatment condition ($t=.32$, $p>.40$), while a significant difference was found in the social treatment condition ($t=-2.07$, $p<.01$). Additional t tests on the social treatment condition with respect to grade revealed no significant differences in the second- ($t=-.27$, $p>.70$) or eighth-grade ($t=-1.01$, $p>.30$) Ss, with only marginal significance in the fifth-grade ($t=-2.15$, $p<.10$). A review chapter by Stevenson (1965) has shown the crossed-sex effect from preschool to adulthood in studies dealing with social reinforcement. Even though some evidence for a crossed-sex effect was found for fifth-grade Ss, the mean for the male Ss (-15.60) and the female Ss (11.58), when averaged as in Figure 1, revealed no overall treatment effect for the social reinforcement condition. A lack of a crossed-sex effect for the correctness treatment

may indicate that the correctness situation was actually perceived by the Ss as informational rather than social. Another possible explanation could be the relative satiated condition of the Ss, as stated above, for social reinforcement and not for correctness reinforcement. Overall, female Ss showed a greater reinforcing effect with social reinforcement. Even though the social treatment did not differ from the control treatment, the finding of a sex effect for the socially reinforced group suggests that, while the message was depersonalized, the situation held some personal meaning for the Ss.

Stevenson's (1965) review chapter cites several studies dealing with the effects of social reinforcement using marble-dropping or marble-sorting tasks. While studies using social approval have generally found a reinforcing effect, perhaps these experiments have not used the most effective reinforcer, especially when older and/or middle-class children are used as Ss. The preceding point could also be generalized to more naturalistic situations, where adults who use verbal approval would do well to use correctness reinforcers to control the child's behavior.

It was generally expected that the effectiveness of correctness reinforcers would increase across age, resulting in a positive linear function. The resulting function, however, was curvilinear, with the fifth-grade Ss manifesting less change in preference than either the second- or eighth-grade Ss. However, as previously reported, the difference between the fifth-grade

and the other age groups was not statistically reliable for either the social or correctness reinforced treatments.

While the form of the function relating correctness reinforcement to age was not confirmed, a simple main effects analysis on the nonsignificant Age X Treatment interaction revealed a reliable treatment difference for the eighth-grade group. Individual F tests indicated that the correctness treatment produced a greater change in response preference than either the social or no reinforcement conditions. Hence, even though the expected positive linear relationship between age and correctness reinforcement did not result, evidence of a definite change in effectiveness of correctness reinforcers did exist for the eighth-grade Ss since words signifying correctness demonstrated a stronger reinforcing effect than either social or no reinforcement. The greater reinforcing effect of correctness reinforcers was not found for the second- and fifth-grade children. Such an effect constitutes a confirmation of one aspect of the correctness hypothesis; namely, different age children vary in the extent to which they are influenced by correctness reinforcers.

Clearer support for the correctness hypothesis can be found in the Rosenhan and Greenwald (1965) study. These authors found that reinforcers signifying correctness produced a greater change in response preference for sixth-grade than second-grade Ss. There were no differences in performance of the second- and sixth-grade Ss using social reinforcers. The results of the present experiment parallel that of Rosenhan and Greenwald (1965) in that

reinforcers signifying correctness produced a significantly greater change in response preference for eighth-grade Ss than second- or fifth-grade Ss, while no significant differences were found for social approval.

A change in the strength in effectiveness of various reinforcers may underlie many age differences in human behavior. Specifically, there seems to be a change from extrinsic, external, concrete to intrinsic, internal, and abstract reinforcers as the child matures. Gewirtz (1954) found that attention and praise as reinforcing agents diminishes with age, while knowledge of being correct increases. Other researchers like Zigler and Kanzer (1962) and Terrell, Durkin, and Wiesley (1959) found that abstract reinforcers are more rewarding for middle- than lower-class children. From these studies it, "appears that any real understanding of the social reinforcement processes demands an appreciation of the intricate relationship between the particular social (verbal) reinforcer being dispensed and the developmental level of the child (Zigler, 1963, p. 619)."

Studies dealing with the mentally retarded have not directly looked for this external-internal change in reinforcer effectiveness (see Stevenson, 1965). However, no change in the effectiveness of various verbal reinforcers would be expected with the retarded. The developmental level of a child is generally paralleled by equal IQ scores. Such an approximation, however, is not true with the retarded. The expectancy that an external-internal change for reinforcer effectiveness would not take place because of the

retarded child's inability to progress to more advanced developmental levels. Future experiments might study this possible lack of verbal reinforcer effectiveness dealing with different levels of MA and IQ.

There are several ways in which the current study could be improved to provide a more sensitive test of the correctness hypothesis. As previously mentioned, several compromises were made to overcome some methodological shortcomings of marble-sorting tasks described by Parton and Ross (1965). Their recommendation of a fixed-intertrial interval to eliminate the S's confounding strategy of increasing his response rate, instead of preference, resulted in a reduction in the number of marble drops the S could make. The addition of a greater number of trials in each treatment block would provide a larger sample of behavior and thereby increase the sensitivity of the study. Moreover, since only one-third of the S's marble drops constituted an estimate of reinforcer effectiveness (e.g., one free-choice response for every three trials), the behavioral sample obtained was further restricted. This procedure was introduced to standardize the number of reinforcements dispensed to each S and to eliminate any possible confounding of the S's initial baserate preference with the number of reinforcers dispensed.

In summary, both the overall and specific hypotheses were partially supported by the present study. The general hypothesis that a change in the strength in effectiveness of various reinforcers takes place with increasing age was discussed. In

addition, correctness reinforcement, as predicted, was found to be more reinforcing than either social or control treatments for eighth-grade Ss. Some questions as to the continued use of approval verbalizations were raised, inasmuch as the social reinforcement treatment did not significantly differ from the control (nonreinforced) group.

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